

6. Clean all apparatus at the end of this experiment. Ask your teacher how to dispose of all waste materials. Check to see that the gas valve is completely shut off and wash your hands before leaving the laboratory.

Micro Experiment 7

Flame Tests

Micro Apparatus

burner and tubing
glass plate, 7 cm x 15 cm
2 cobalt glass plates

Flame Tests

platinum wire sealed in glass
9 thin stem pipettes

Micro Materials (in thin stem pipettes)

6 M hydrochloric acid
0.5 M barium nitrate
0.5 M calcium nitrate
0.5 M lithium nitrate
0.5 M potassium nitrate
0.5 M copper nitrate

0.5 M strontium nitrate
0.5 M sodium chloride
solid sodium chloride
sodium nitrate
distilled water
unknown solutions

Micro Procedures

Record all observations in your Data Table as you complete each procedure.

1. Thoroughly clean a 7 cm x 15 cm glass plate. Rinse with distilled water and dry.

CAUTION Hydrochloric acid is caustic and corrosive. Avoid contact with skin and eyes. Make certain that you wear gloves, safety goggles and an apron when working with acids. If any should spill on you, immediately flush the area with water and then notify your teacher.



CAUTION Before you use the burner in this experiment, check to see that long hair and loose clothing have been confined.



2. Put 5 drops of 6 M hydrochloric acid on the plate. Clean a platinum wire by dipping it first in the HCl and then holding it in the colorless flame of the burner. Repeat until the wire imparts no color to the flame. Put more drops of HCl on the plate if necessary. Rinse and dry the plate.
3. Put two drops of each of the nitrate solutions on the plate as shown in the diagram. Put a row of 6 M HCl drops on the plate directly below the nitrate solutions as shown in the diagram.
4. Dip the wire into the barium nitrate solution and then hold it in the flame. Observe the color of the flame and record it in the Data Table. Clean the wire by dipping it into the first drop of 6 M HCl and proceeding as described in Step 2.

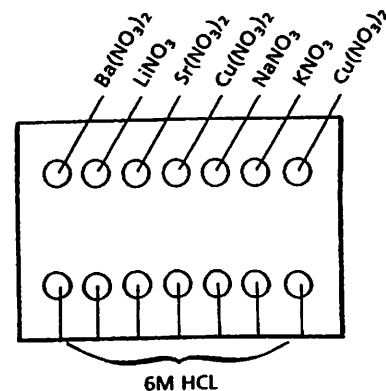


Figure 7-1

5. Repeat Step 4 with the nitrates of lithium, strontium, calcium, potassium, copper, and sodium. Clean the wire thoroughly after each test. Record the colors of the flames in the Data Table.
6. If two metals are present in the same solution, the color of one flame may obscure that of the other. If cobalt glass plates are used, it is sometimes possible to absorb one color and not the other. Examine the sodium nitrate flame through at least two thicknesses of cobalt glass. Repeat, using the potassium nitrate flame with the cobalt glass. Record the colors of the flames in the Data Table.
7. Flame-test a mixture of the solutions of the nitrates of sodium and potassium with a clean wire. Observe the color the mixture imparts to the flame when viewed without the cobalt glasses. Repeat the test, but observe the flame as seen through the cobalt glasses. Record the colors of the flames in the Data Table.
8. Clean the wire and test a solution of sodium chloride.

Observation: _____

9. Place a few crystals of solid sodium chloride on the glass plate. Dip the wire into the crystals and then hold the wire in the flame.

Observation: _____

10. Secure an unknown from your teacher. Test it in the flame as you did with the known solutions. Place your answer in the Data Table.
11. Rinse the glass plate and dry it. Put away the thin stem pipette as your teacher directs. Wash and dry your hands and check to see that the gas valve is shut off.

Strategy for Predicting

Be sure that the wire is clean. If you are not sure of the identity after testing the unknown, retest the known solution of the metal you predict.

| Data Table | |
|--|----------------|
| Metallic Ion in Compound | Color of Flame |
| sodium | |
| lithium | |
| strontium | |
| calcium | |
| barium | |
| potassium | |
| copper | |
| sodium (cobalt glass) | |
| potassium (cobalt glass) | |
| sodium and potassium | |
| sodium and potassium (cobalt glass) .. | |
| unknown metal | |

Questions

1. Is flame coloration a test for the metallic ion or for the nitrate ion?

2. Why do dry sodium chloride and the solutions of sodium nitrate and sodium chloride all impart the same color to the flame?

3. Describe the test for sodium ions and potassium ions when both are present.

4. How would you characterize the flame test with respect to its sensitivity?

5. What difficulties may be encountered in the use of the flame test for identification?

General Conclusions

1. A student recorded the following results when testing three unknowns. Identify the unknowns by referring to your data table.
Unknown #1 yellowish green _____
Unknown #2 scarlet _____
Unknown #3 yellow without
cobalt glass, violet
with cobalt glass _____
2. Several of the flame tests were shades of red. What should be done in the laboratory to correctly identify one of these ions?

3. During a flood, the labels from three bottles of chemicals floated away. The unlabeled bottles of white solids were known to contain the following: strontium nitrate, ammonium carbonate, and potassium sulfate. Explain how you could easily relabel these three bottles.

Correlating Your Facts

Review Chapter 24, Section 24.1, and Chapter 4, Section 4.1, and correlate what you have read with what you have learned by performing this experiment.

Describe the activity of electrons when a substance is vaporized in a flame. What is viewed through a spectroscope and how does this instrument serve in identifying substances?
